MULTIMODAL POLYOLEFIN PIPE

This application is a Divisional of application S.N. 10/088,327, filed March 13, 2002, and now U.S. Patent No. 6,642,313,

5-04 NMW

TECHNICAL FIELD

The present invention relates to polyolefin pipes made from a multimodal resin, a high density ethylene copolymer resin per se, and a process for preparing the resin.

BACKGROUND ART

There are a number of recent developments relating to polymers made using catalysts having a single or uniform active site such as a metallocene catalyst or constrained geometry catalyst. One class of polymers made using these types of catalysts systems is polyethylene, typically low density polyethylene. In some cases the polymers may contain long chain branching. The present invention relates to high density copolymers of ethylene.

Representative of the above art are Exxon's United States Patents (USP) 5,382,630 and 5,832,631 both issued January 17, 1995 to Stehling et al. The patents disclose blends of linear low density polyethylene. The blend per se has a polydispersity (Mw/Mn) greater than 3 while each component in the blend has a polydispersity of less than or equal to 3 and a different average molecular weight. The 631 patent is restricted to blends having a density from 0.88 to 0.900 g/cm^3, which is well below the density of the blends of the present invention. The 630 patent claims blends having a density greater than 0.900 g/cm^3, preferably from 0.900 to 0.940 g/cm^3, which is essentially free of components having a higher average molecular weight and lower average comonomer content than that of any other component in the resin. This later feature is essentially directed to "reverse comonomer incorporation". Typically with conventional catalysts at a higher molecular weight there is a reduced tendency for the incorporation of the comonomer. (Or put the other way, the comonomer incorporation tends to be higher in the low molecular weight component of the polymers.) Additionally, the references disclose polymerizations at relatively low temperatures, such as gas phase